A comparative study between the results of streak retinoscope and auto refractometer

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Abstract

Introduction: To compare the results of subjective refraction between autorefractometer and streak retinoscope. **Materials and method:** 200 consecutive patients above sixteen years of age presenting for subjective refraction were included. Results were documented and compared with the help of SPSS 20.0.1 and GraphPad Prism version 5. **Results:** In the spherical equivalent component; the mean difference between Autorefractometer (AR) minus Subjective refraction(SR) was -0.1123D and between retinoscopy (RR) and subjective refraction it was 0.0137D. The spherical equivalent difference between AR and SR is more in case of hypermetropia (48.9% in Group II) and myopia (46.7% in Group II) than other type of ametropia. In case of RR –SR it is not significant. **Conclusion:** Streak retinoscope gives more similar results as subjective refraction.

Keywords: Refraction; Retinoscopy; Streak Retinoscope; Subjective refraction.

Refractive error is one of the most common causes of visual impairment around the world and is the second leading cause of treatable blindness. Prevalence of blindness due to refractive error in India is near about 0.26 % for all age group and low vision in India due to refractive error is about 145 million (WHO 2008).[1]

Refractive error is a remediable cause of visual impairment, with correction of significant refractive error being a priority of VISION 2020: The Right to Sight, the joint global initiative of the World Health Organization's (WHO) and the International Agency for the Prevention of Blindness. Refractive error has a severe social and economic impact on individuals and communities, restricting educational and employment opportunities of otherwise healthy individuals. Compared to cataract, early onset of refractive error accounts for twice as many blind-person years.

Refractive errors were found to be responsible for a significant proportion of blindness and moderate visual impairment in the population of India. Several other factors including genetic and environmental influences like near work, night lighting, and UV exposure are also believed to play a role in determining the refractive status of the eye.

Detection and correction of refractive errors is very important to prevent irreversible vision loss and to eliminate any visual impairment for social and economical point of view.

Automatic refractors have become more important in recent years because of the busy clinical schedule of ophthalmologists and increasing faith of patients in sophisticated mechanical devices. Many such refractometers, subjective and objective, are now available, with steadily improving designs and greater claims to accuracy.

The present study was undertaken to compare the accuracy of the autorefractometer with traditional streak retinoscope as a means of determining the approximate subjective refraction in these patients.

Material and Method:

This was a prospective, cross sectional comparative study where 200 consecutive patients above sixteen years of age were examined at Ophthalmology OPD in a medical college between January 2015 to December 2015. Patients having lenticular or corneal opacity, patients having eccentric and poor fixation and patients having concurrent retino choroidal pathology causing reduction in the vision were excluded from the study.

Visual acuity, slit lamp biomicroscopy and fundoscopy were performed to rule out any non-refractive etiology

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causing reduction in the vision in these patients. Then refractive error of these patients was determined by streak retinoscope and autorefractometer, after that their result was compared by the subjective method of refraction test.

For statistical analysis; data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS 20.0.1 and GraphPad Prism version 5. Data have been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. The median and the interquartile range have been stated for numerical variables that are not normally distributed. Student's independent sample's t-test was applied to compare normally distributed numerical variables between groups; unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate.

Results:

In this study out of 400 eyes, 231 eyes were hypermetropic which was most commonly found in 40 – 60 years age group (147 eyes). Second most common refractive error was myopia (137 eyes) which was most commonly found in 26 – 40 years age group (66 eyes) (Table-1).

In the spherical component of refraction, the mean difference between Autorefractometer minus Subjective refraction was 1.039D, between retinoscopy and subjective refraction was -0.0106D. In cylindrical component, the mean difference between Autorefractometer minus Subjective refraction was 0.0187D and between retinoscopy and subjective refraction was -0.0031D. In the spherical equivalent component; the mean difference between Autorefractometer minus Subjective refraction was -0.1123D and between retinoscopy and subjective refraction it was 0.0137D. Subjective refraction, in hypermetropia 186 eyes fell belonged to group I. The SD of spherical component between Autorefractometer minus Subjective refraction was 0.3711D, between retinoscopy and subjective refraction it was 0.0812. In cylindrical component between Autorefractometer minus Subjective refraction it was 0.5287D, between retinoscopy and subjective refraction it was 0.1151D. In the spherical equivalent component between Autorefractometer minus Subjective refraction was 0.4480D between retinoscopy and subjective refraction it was 0.0982D (Table-2).

All components of refractive error were divided in 3 groups (I = ±0.25D, II = ±0.50D, III = >±0.50D power).In myopia autorefractometer was even more accurate. Out of 137 eyes, 132 eyes fell in group I, 2 eyes in group II and 3 in group III respectively (Table 3A1). In spherical component

Table:1 Refractive error and distribution by age of 201 patients.

	AGE (Years)				
Type of Error	**16-25**	**26-40**	**41-60**	**>60**	**Total**
Aphakia	0	0	0	4	40
Emmetropia	4	13	5	0	22
Hypermertropia	13	45	147	28	231
Mixed astigmatism	0	0	3	3	6
Myopia	9	66	47	15	137
Total	26	124	202	50	400

p < 0.001; Statistically significant

Table 2: Mean differences and standard deviation between autorefractometer and subjective refractive result , and retinoscopy and subjective refractive data

		Mean	SD
Spherical Power	Auto Refractometer -subjective	.1039	.3711
	Retinoscopy Refractometer -subjective	-.0106	.0812
Cylinder Power	Auto Refractometer -subjective	.0187	.5287
	Retinoscopy Refractometer -subjective	-.0031	.1151
Spherical Equivalent	Auto Refractometer -subjective	-.1123	.4480
	Retinoscopy Refractometer -subjective	.0137	.0982

Table 3A1: Difference of sphere component between autorefractometer and subjective refraction in different types and grades of refractive error

	Spherical Difference (Auto Refractometer-subjective)			
Error	**I**	**II**	**III**	**Total**
Aphakia	0	0	4	4
Emmetropia	21	1	0	22
Hypermertropia	186	44	3	233
Mixed astigmation	1	3	2	6
Myopia	132	2	3	137
Total	340	50	12	402

I : Difference equal to ±0.25D; **II :** Difference equal to± 0.5D
III : Difference more than± 0.5D; p < 0.001; Statistically significant

Table 3B1: Difference of cylindrical component between autorefractometer and subjective refraction in different types and grades of refractive error

	Cylinderical Difference (AR-SR)			
Error	**I**	**II**	**III**	**Total**
Aphakia	1	3	0	4
Emmetropia	21	1	0	22
Hypermertropia	108	122	3	233
Mixed astigmatism	6	0	0	6
Myopia	137	0	0	137
Total	273	126	3	402

I : Difference equal to ±0.25D; **II :** Difference equal to± 0.5D
III : Difference more than± 0.5D; p=0.0001, Statistically significant

difference between retinoscopy refraction minus subjective refraction, all 233 eyes of hypermetropia and 137 eyes of myopia fell in group I (Table 3A2). In the cylindrical component difference between autorefraction minus subjective refraction, in hypermetropia 108 eyes were found to be in group I and 122 eyes in group II and 3 in group III. In myopia all of 137 eyes were found in group I (p< 0.0001) (Table 3B1). In the cylindrical component; difference between retinoscopy refraction minus subjective refraction, in hypermetropia 231 eyes were in group I, 2 eyes in group II. In myopia all 137 eyes were in group I (p=0.0001) (Table 3B2). The spherical equivalent difference between AR and SR is more in case of hypermetropia (48.9% in Group II) and myopia (46.7% in Group II) than

Table 3A2: Difference of sphere component between retinoscopy and subjective refraction in different types and grades of refractive error

	Spherical Difference (RR-SR)			
Error	**I**	**II**	**III**	**Total**
Aphakia	4	0	0	4
Emmetropia	22	0	0	22
Hypermertropia	233	0	0	233
Mixed astigmatism	6	0	0	6
Myopia	137	0	0	137
TOTAL	402	0	0	402

I : Difference equal to ±0.25D; **II :** Difference equal to± 0.5D
III : Difference more than± 0.5D

Table 3B2: Difference of cylindrical component between retinoscopy and subjective refraction in different types and grades of refractive error

	Cylinderical Difference (RR-SR)			
Error	**I**	**II**	**III**	**Total**
Aphakia	4	0	0	4
Emmetropia	22	0	0	22
Hypermertropia	231	2	0	233
Mixed astigmatism	6	0	0	6
Myopia	137	0	0	137
Total	400	2	0	402

I : Difference equal to ±0.25D; **II :** Difference equal to± 0.5D
III : Difference more than± 0.5D; p=0.0001, Statistically significant

Table 3C1: Difference of spherical equivalent between auto-refractometer and subjective refraction in different types and grades of refractive error

Spherical Equivalent (Auto Refractometer –Subjective)				
Error	**I**	**II**	**III**	**Total**
Aphakia	0	0	4	4
Emmetropia	15	5	2	22
Hypermertropia	78	114	41	233
Mixed astigmatism	4	1	1	6
Myopi	53	64	20	137
Total	150	184	68	402

I : Difference equal to ±0.25D; II : Difference equal to± 0.5D
III : Difference more than± 0.5D; p=0.0001, Statistically significant

Table 3C2: Difference of spherical equivalent between retinoscopy and subjective refraction in different types and grades of refractive error

Spherical Equivalent (Retinoscopy Refractometer -Subjective)			
Error	**I**	**II**	**Total**
Aphakia	4	0	4
Emmetropia	22	0	22
Hypermertropia	232	1	233
Mixed astigmatism	6	0	6
Myopia	136	1	137
Total	400	2	402

I : Difference equal to ±0.25D; II : Difference equal to± 0.5D
p=0.3315

other type of ametropia (Table 3C1). In case of RR –SR it is not significant (Table 3C2).

In case of percentage difference of various refractive components between autorefraction and subjective refraction, 76.36% fell within ±0.25D. In retinoscopic refraction minus subjective refraction, it was 82.5% within ±0.25D. In cylindrical component, percentage of difference between AR and SR, 42% fell within ±0.25D whereas in RR and SR, it was 85.5%. In degree of axis difference, 47.5% were <10º in AR-SR and 65.5% were <10º in RR-SR (Table 4).

Degree of axis difference between AR and SR in hypermetropia, 107 eyes had d" 10º axis difference, 102 eyes had >10º axis difference. In myopia 85 eyes had d"10º and 33 eyes had > 10º difference in axis (p< 0.0001). Degree of axis difference between RR and SR in hypermetropia, 154 eyes had d"10º, 53 eyes had > 10º axis difference. In myopia 108 eyes had d"10º and 12 eyes had > 10º axis difference (p<0.0001) (Table 5A). In RR and SR; the difference in hypermetropia 66.4% ind" 10º and 22.6% in e"10 º. In case of myopia; 78.8% were in d"10º and 8.8% were ine" 10º. And in mixed astigmatism eyes; 50% eyes were in d"10º and 25% eyes were in e"10º difference (Table 5B).

When the components of refractive error were analyzed according to various age groups, it was seen that the difference of spherical component between AR and SR was found to be greater in the age group above 40 years compared to the age group below 40 years. It was also found that the difference of cylindrical component between AR and SR was much higher in the older age group (>40years) compared to the younger ones (< 40 years)

Table 4: Percentage of difference between autorefractometer data and subjective data v/s retinoscopy data and subjective data of various refractive components

	Spherical Equivalent		**Sphere component**		**Cylinder component**		**Axis**		
	±0.25	**±0.50**	**±0.25**	**±0.50**	**±0.25**	**±0.50**	**≤10**	**>10**	**NO**
AR-SR	37.3	83.0	76.36	96.01	42.2	88.7	47.5	36.6	15.9
RR-SR	80.5	95.6	82.5	96.6	85.5	97.1	65.5	18.6	15.9

Table 5A: Difference of cylindrical axis between autorefractometer and subjective refraction in different types and grades of refractive error

	Axis Aggrement (AR-SR)			
Error	**No**	**≤10º**	**>10º**	**Total**
Aphakia	0	3	1	4
Emmetropia	11	2	9	22
Hypermertropia	24	107	102	233
Mixed astigmatism	0	4	2	6
Myopia	19	85	33	137
Total	54	201	147	402

p<0.0001

Table 5B: Difference of cylindrical axis between retinoscopy and subjective refraction in different types and grades of refractive error

	Axis Aggrement (RR-SR)			
Error	**No**	**≤10º**	**>10º**	**Total**
Aphakia	1	2	1	4
Emmetropia	11	3	8	22
Hypermertropia	25	154	53	232
Mixed astigmatism	0	6	0	6
Myopia	17	108	12	137
Total	54	273	74	401

p<0.0001

(p= 0.0003). Degree of axis difference between AR and SR was found to be slightly greater in the older age group >40years as compared to the younger ones (< 40 years) (Table 6A1). In case of spherical component; difference between retinoscopy and subjective refraction it is within 0.25D, hence p value is not applicable (Table 6A2). In case of cylindrical component; difference between AR and SR was more in the patients who were older than 60

Table 6A1: Difference between autorefractometer data and subjective refraction data for various age groups in different types of refractive error

	Spherical Component (AR-SR)			
Age	**I**	**II**	**III**	**Total**
16-25	23	3	0	26
26-40	111	11	2	124
41-60	165	33	4	202
>60	41	3	6	50
Total	340	500	12	402

I : Difference equal to ±0.25D; II : Difference equal to± 0.5D
III : Difference more than± 0.5D; p=0.0013

Table 6A2: Difference between retinoscopy data and subjective refraction data for various age groups in different types of refractive error

	Spherical Difference (RR-SR)
Age	**I**
16-25	26
26-40	124
41-60	202
>60	50
Total	402

I : Difference equal to ±0.25D; II : Difference equal to± 0.5D
III : Difference more than± 0.5D

years (Table 6B1). In case of RR and SR the difference is within±0.25D in all the age group (Table-6B2). The axis difference between AR and SR was more in 26- 40 years of age group (Table-6C1) than other age group and the difference between RR and SR was minimum within 10º (Table-6C2). In case of spherical equivalent; the difference between AR and SR was more in 25 to 61 years age group (Table 6D1). In case of RR and SR the difference was not significant; 99.9% eyes of all age group were in± 0.25D (Table 6D2).

Table 6B1: Difference between autorefractometer data and subjective refraction data for various age groups in different types of refractive error

	Cylindrical Difference (AR-SR)			
Age	**I**	**II**	**III**	**Total**
16-25	21	5	0	26
26-40	101	23	0	124
41-60	126	73	3	202
>60	25	25	0	50
Total	273	126	3	402

I : Difference equal to ±0.25D; II : Difference equal to± 0.5D
III : Difference more than± 0.5D; p=0.0003

Table 6B2: Difference between retinoscopy data and subjective refraction data for various age groups in different types of refractive error

	Cylindrical Difference (RR-SR)		
Error	**I**	**II**	**Total**
16-25	24	2	26
26-40	124	0	124
41-60	202	0	202
>60	50	0	50
Total	400	2	402

I : Difference equal to ±0.25D; II : Difference equal to± 0.5D
p<0.0001

The mean difference in the spherical component between autorefractometer and subjective refraction in the16 to 25 years of age group was -0.0385D, in 26 to 40 yrs of age group it was -0.0444D, in 41 to 61 years of age group was 0.1696D and the value above 60 years was 0.2800D. The mean difference between the retinoscopy and subjective refraction ; in the 16 to 25 years of age group was -0.0385D, in 25 to 40 years of age group was -0.0302D, in 40 to 60 years of age group was 0.0025D and in above 61 years it was 0.0102D.

Table 6C1: Difference between auto refractometer data and subjective refraction data for various age groups in different types of refractive error

	Axis Difference (AR-SR)		
Error	**I**	**II**	**Total**
16-25	15	11	26
26-40	68	56	124
41-60	124	78	202
>60	32	18	50
Total	239	163	402

p=0.5997

Table 6C2: Difference between retinoscopy data and subjective refraction data for various age groups in different types of refractive error

	Axis Difference (RR-SR)		
Error	**I**	**II**	**Total**
16-25	26	0	26
26-40	123	1	124
41-60	202	0	202
>60	50	0	50
Total	401	1	402

p=0.5226

The mean difference in the cylindrical component between autorefractometer and subjective refraction in the 16 to 25 years group was -0.1154 D, in 25 to 40 years age group it was -0.1310 D, in 41 to 60 years of age group was 0.1337 D, in the above 60 years of age group it was -0.0400D. The difference between retinoscopy and subjective refraction in the 16 to 25 age group was 0.0865D, in the 26 to 40 years age group was -0.0302D, in 41 to 60 years of age group it was 0.0012D, in above 61 years of age it was 0.0001D.The mean difference in the axis component between autorefractometer in the 16 to 25 years age group was 9.3077º. In 26 to 40 years age

Table 6D1: Difference between autorefractometer data and subjective refraction data for various age groups in different types of refractive error

	Spherical Equivalent (AR-SR)			
Age	**I**	**II**	**III**	**Total**
≤25	11	12	3	26
26-40	52	51	21	124
41-60	70	94	38	202
>60	17	27	6	50
Total	150	184	68	402

p=0.6291

Table 6D2: Difference between retinoscopy data and subjective refraction data for various age groups in different types of refractive error

	Spherical Equivalent (RR-SR)		
Age	**I**	**II**	**Total**
16-25	26	0	26
26-40	122	2	124
41-60	202	0	202
>60	50	0	50
Total	400	2	402

p=0.2117

group; it was 2.5242º, in 41 to 60 years of age group was -5.8069º, in above 61 years group it was -26.9200º.

The mean difference in the spherical equivalent component between autorefraction and subjective refraction in the 16 to 25 years of age group was 0.0777D, in the 26 to 40 years of age group it was 0.1102D, in the 41 to 60 years of age group it was -0.2367D, in the above 61 years of age group it was -0.2600D. The difference between retinoscpy and subjective refraction in 16 to 25 years of age group was 0.0154D, in 25 to 40 years of age group it was 0.0459D, in 41 to 60 years of age group it was -0.0029D, and in above 61 years of age group it was 0.0001D (Table 6E).

Discussion:

It had been showed by Ghose S et al that the spherical and cylindrical components and spherical equivalents skewed towards more minus (or less plus), especially so in emmetropes, low hypermetropes, and low myopes.[2] This error declined with increasing age over 40 years and was also significantly lower in aphakia and mixed astigmatism. Determination of cylinder axis was found to be reliable on the NR-1000F. However in my study error was more in the older age group (> 40 years). The reason of this difference may be due to the difference in our exclusion criteria of age. It was > 16 years in my study whereas it was > 6years in their study. As children have a higher accommodative power, the error tends to be more in children in autorefractometer. Difference in results may also be due to autorefractometer of different in model and manufacturers[2]. Dyson C examined four hundred eyes with the autorefractor and compared with standard technique of clinical refraction with or without cycloplegia and found that values were similar for spherical power, cylindrical power and spherical equivalent but less so for cylindrical axis[3].This study more or less matches results of current study where the spherical, cylindrical component and spherical equivalent values of autorefractometer are close to subjective refraction ($p<0.05\%$). However in their study cylindrical axis (47.5% less than 10º and 36.6% more than 20º) did not match with clinical refraction but in my study results were comparable as p value was statistically significant.

Durrani K et al performed autorefraction alone using a Canon R-10 Autorefractor and manifest refraction at the same visit[4]. A clinically significant difference between autorefraction and manifest refraction was defined as a difference of >0.50 D in sphere, cylinder, spherical equivalent or weighted axis and/or >10° in axis. In 266 right eyes, the median difference between auto refraction and manifest refraction in spherical corrections was +0.01 D (p=0.85), -0.33 D in cylindrical corrections. In the current study mean difference in spherical component between AR-SR was 0.1039D and between RR-SR was 0.106D, in cylindrical component mean difference between AR-SR was 0.0187D and between RR-SR was -0.031D.This study results did not match with the present study probably due to patient selection criteria differences.

Table 6E: Difference of mean and standard deviation between auto refraction-subjective refraction versus retinoscopy-subjective refraction data for various age groups in different types of refractive error and p-value of different component

	Age (Yrs)	Mean	SD	p- Value
Sphere Component (AR-SR)	16-25	-.0385	.3293	0.3298
	26-40	-.0444	.3732	
	41-60	.1696	.2663	
	4 >60	.2800	.5616	
Sphere Component (RR-SR))	16-25	-.0385	.1359	0.0008
	26-40	-.0302	.1175	
	41-60	.0025	.0431	
	4 >60	.0000	.0000	
Cylinder Component (AR-SR)	16-25	-.1154	.4649	0.0001
	26-40	-.1310	.4491	
	41-60	.1337	.4045	
	4 >60	-.0400	.9413	
Cylinder Component (RR-SR))	16-25	.0865	.2115	<0.001
	26-40	-.0302	.1481	
	41-60	.0012	.0683	
	4 >60	.0000	.0714	
Axis (AR-SR)	16-25	9.3077	61.4008	0.1134
	26-40	2.5242	73.5448	
	41-60	-5.8069	84.7957	
	>60	-26.9200	67.0671	
Axis (RR-SR)	16-25	.0000	.0000	<0.0001
	26-40	.0000	.6376	
	41-60	.0000	.0000	
	>60	.0000	.0000	
Spherical Equivalent (AR-SR)	16-25	.0777	.3963	<0.001
	26-40	.1102	.4406	
	41-60	-.2367	.3924	
	4 >60	-.2600	.4614	
Spherical Equivalent (RR-SR	16-25	.0154	.1657	0.0001
	26-40	.0459	.1377	
	41-60	-.0029	.0545	
	>60	.0000	.0343	

As per study done by Ghose S et al Determination of cylinder axis was found to be reliable on the NR-1000F.[2] In current study; in case of AR-SR the axis difference in 50% eye was between 10^{p} and in 36.6% greater than or equal to 20^{p}. And in case of RR-SR the axis difference was 68.1% less or equal to 10^{p} and 18.5% were equal to or more 20^{p}. This result matches with the current study.

Another study done by Dyson C where he found that in both auto refractor and standard technique of clinical refraction had similar result for all the component except axis component[3]. These results did not match with my study.

As per study done by Peng MY et al the cylindrical power and axis were more similar in both auto refraction and refraction done by pediatrics ophthalmologist in same sitting under cycloplegia[5]. In this study the cylinder difference was less than ±0.25D(67.9%) in AR-SR and in RR –SR it was 99% which matches with the above said study.

A study done by Wood MG et al where they used Nidek ARK-900 (3rd generation auto refractor) objective refractor and retinoscopy and subjective refraction and they found that 96%of the children read the 20/30 line perfectly with the result from the objective refractor compared to 88% with retinoscopy which means all the components of auto refractor results were nearer than the retinoscopy result[6]. Results of present study were not similar with this study which may be due to my case selection or avoid of cycloplegia in all my patients or may be due to our GR-2100 instrument.

Gole GA et al did refraction by streak retinoscope and retinomax autorefractor[7]. They found Sphere, cylinder, axis of cylinder and spherical equivalent measurements were generally close between the two examination methods, although the Retinomax consistently read around 0.3 D less hyperopic than Retinoscope. This study is also similar with this study except in case of axis and spherical equivalent.

Another study done by Wübbolt IS et al on comparisons of manual and automatic refractometry with subjective results and they found that the smallest standard deviation of the measurement error was found for the auto refractometer RM-A 7000[8]. Both the PR 60 and retinoscopy had a clearly higher standard deviation. The result of my study is similar with this result. The standard deviation of various refraction components are very small (below 0.3D) in age group of 16 yr to 60 yr where most of the patients were included.

A study done by Jorge J et al concluded that auto refractor yields more positive values than the subjective ones (0.05 +/- 0.13 D; p = 0.001)[9]. By comparing retinoscopy with the subjective examination, there are no statistically significant differences found for the M component (-0.02 +/- 0.33 D; p = 0.304). In this study we found that auto refractor yields more negative values than subjective ones. Retinoscopy yields slight positive values than subjective ones. It may be due to patients being more hyperopic in this study.

In Another study done by Pokupec R et al found that the autorefractometer on narrow pupils shows an increased diopter of nearsightedness (myopia), according to the results of this study, it has also been shown that the automated refractometer on narrow pupils can be used as a screening method in determining refractive errors in children[10]. In this study It was found that increased diopter of nearsightedness occurs in case auto refraction versus subjective refraction group slight more than in retinoscopy versus subjective group, which is similar; though the difference was minimum than hypermetropic patients which may be due to my age criteria of patient, where accommodation was less in strength.

Another study done by Nayak BK et al naming an evaluation of the NR-100OF AutoRefractometer in high refractive errors, they found that the high myopia eyes skewing towards more minus though slight degree skewing observed in other ametrope[11]. On the other hand the high hypermetropia eyes skewing towards more plus on manifest auto refraction. Though the all myopic patients are below 22 years and hypermetropic patients are above 25 years. In my study hypermetropic eyes skewing more towars plus than the myopic towards more minus. It may be due to age of the patients in my study and also due to instrument used which may not cause induced myopia.

Conclusion:

From above information it is obvious that the the streak retinoscopic results are more similar to subjective acceptance data than the auto refractor data al though experience is required for retinoscopic examination. In case of autorefraction though the data are less similar to RR it can be used as a starting point for subjective refraction. It is advantageous for young practitioners who are not so experienced with retinoscopic examination.

Autorefraction is also superior for being less time consuming in our busy practice life and in terms of patient acceptability.

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